

LEAST
AERODYNAMICALLY-
EFFECTIVE REGION
OF A BODY (THE BULK
OF A TYPICAL, FABRIC
SAIL)

MOST AERODYNAMICALLY-
EFFECTIVE REGION OF A
BODY (THE "LEADING EDGE")

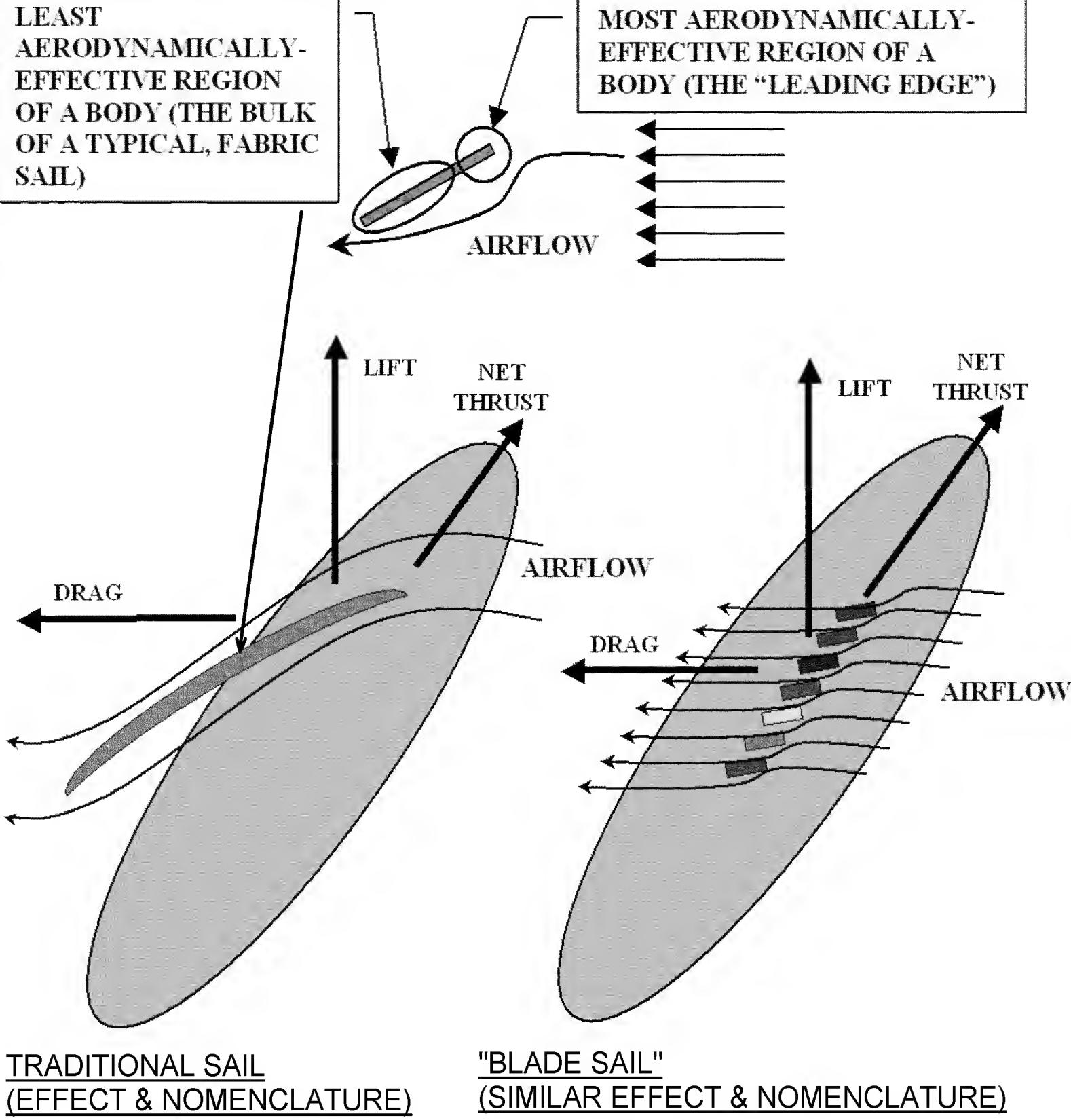
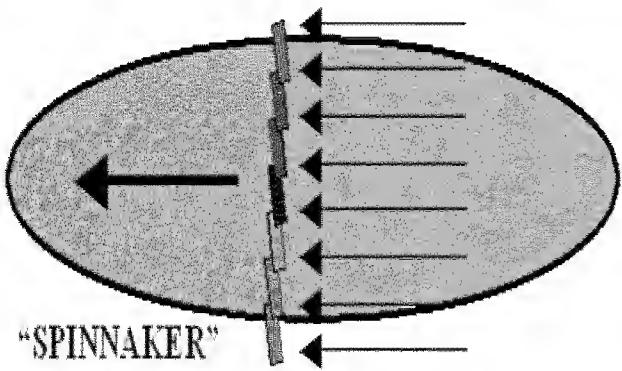
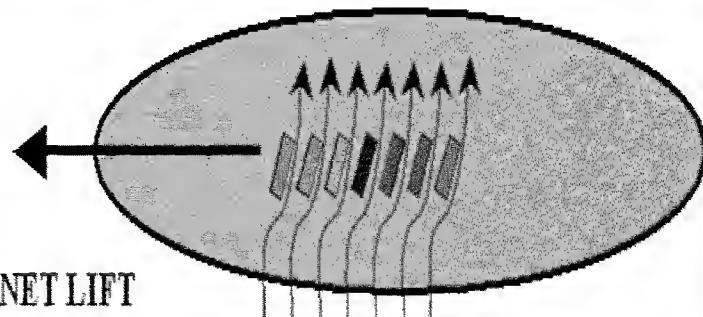


FIGURE 1: DEPICTION OF A RELATED CONCEPT OF MAXIMUM LIFT AND MINIMUM DRAG PER WETTED AREA FOR THE LEADING EDGE REGIONS OF TYPICAL BODIES IN SUBSONIC AIRFLOW (SUCH AS A HIGHER LIFT-TO-DRAG RATIO FOR THE MULTIPLE LEADING EDGES OF A BLADE SAIL vs. THE SAME SAIL AREA IN A TRADITIONAL SAIL, FOR ANY GIVEN APPARANT WIND SPEED AND DIRECTION)

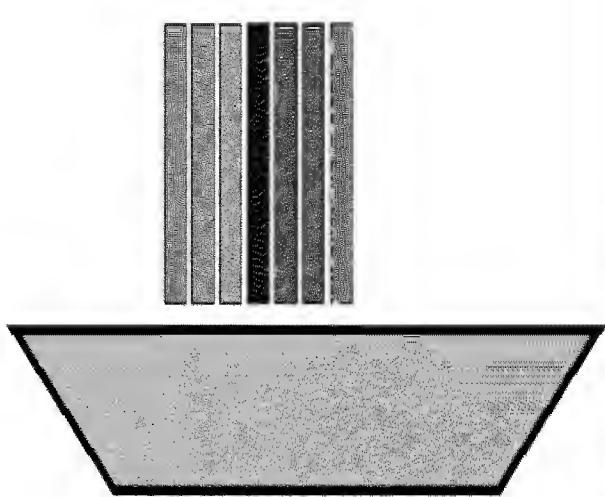
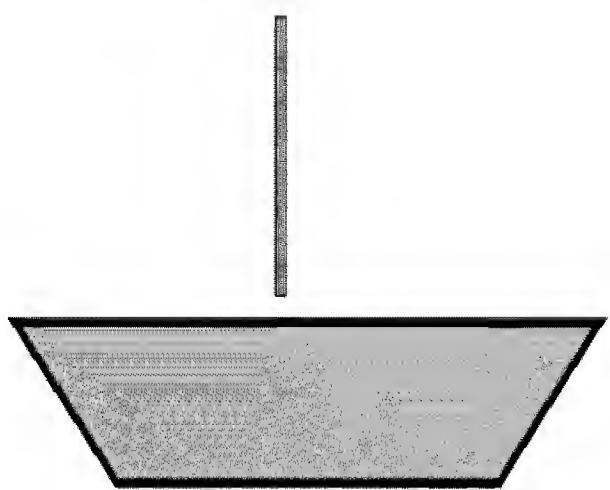


"SPINNAKER"
EFFECT
(On a run, with
boom rotated
and all blades
closed)



NET LIFT
(on beam
reach)

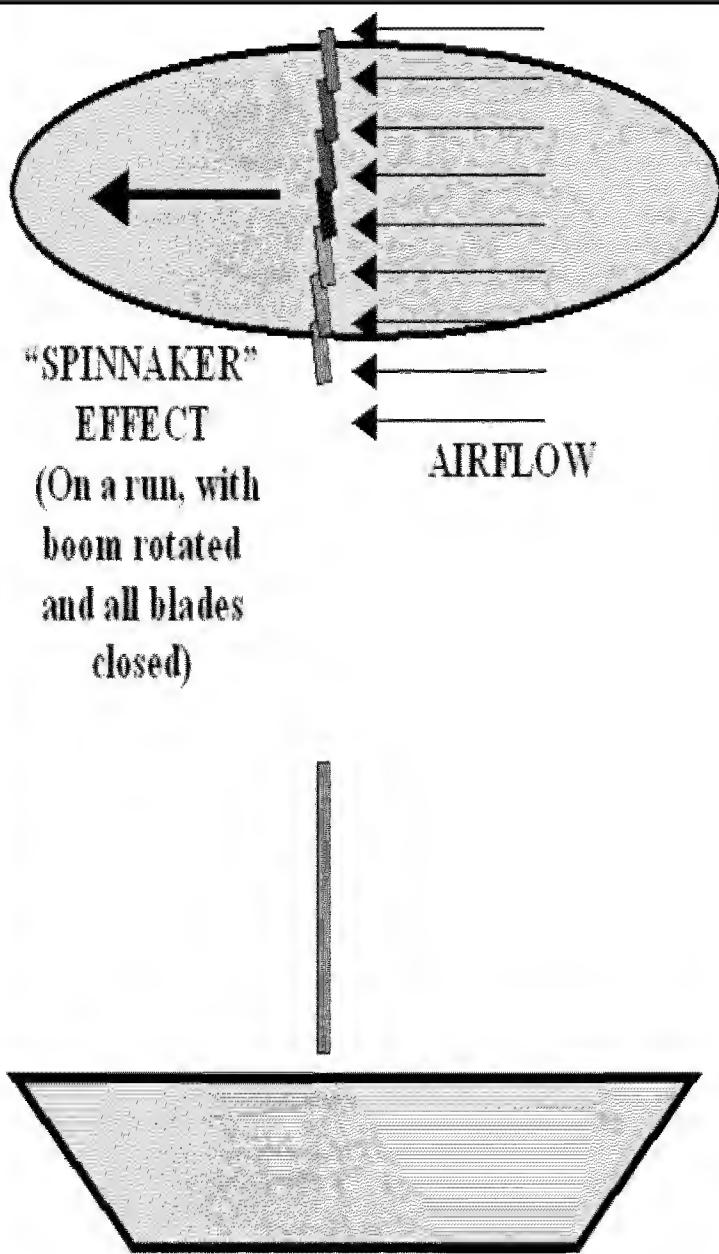
AIRFLOW



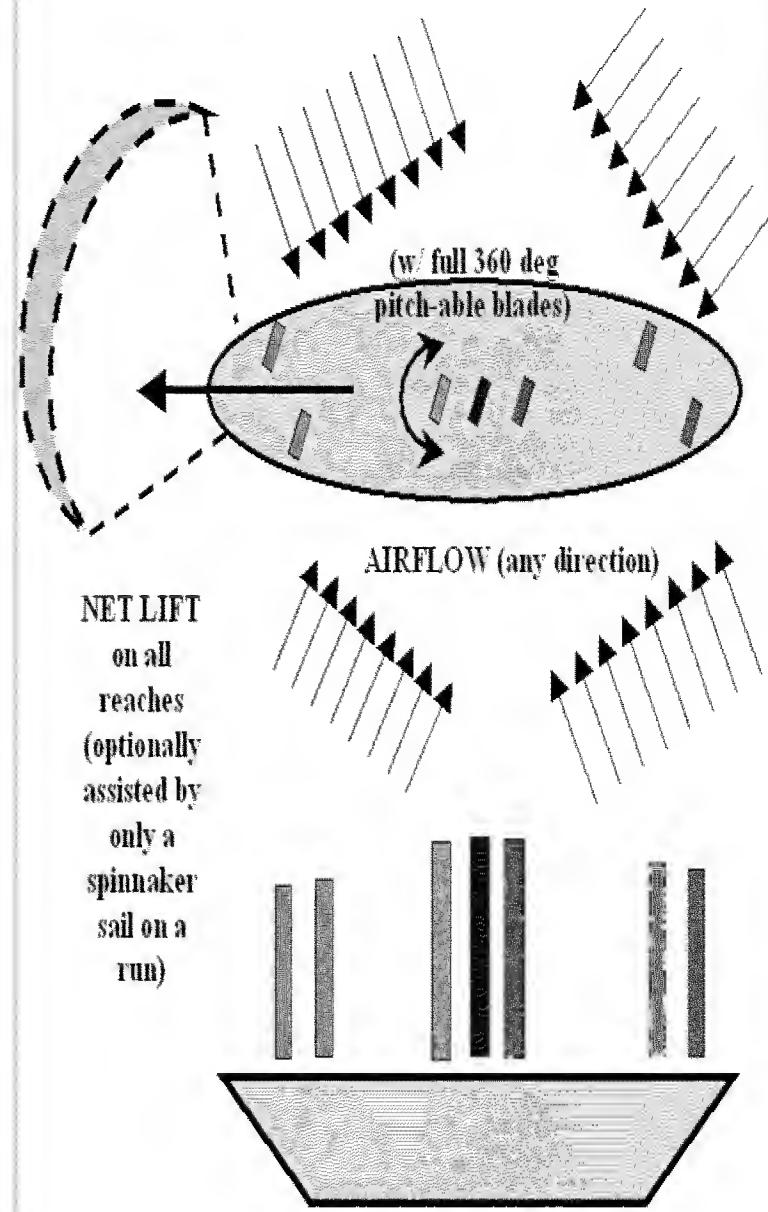
BLADE SAIL (BOOMED) SHOWN IN
"RUN" POSITION

BLADE SAIL (BOOMED) SHOWN IN
BEAM REACH POSITION

FIGURE 2: EXAMPLE OF MORE-EFFICIENT "BLADE SAIL" CONFIGURATION (WHERE A GREATER LIFT AND LIFT-TO-DRAG RATIO IS CREATED PER THE SAME SAIL AREA AS A TRADITIONAL SAIL - WHILE SHORTENING THE EFFECTIVE MAST HEIGHT AND ALLOWING SAFER AND MORE-EFFECTIVE TACKING, SAIL TRIM, AND THRUST CONTROL)



SAIL CONFIGURATION ON A BOOM
(SHOWN ROTATED FOR A RUN)



SAIL CONFIGURATION AS DEPLOYED
AROUND DECK (WITHOUT A BOOM)

FIGURE 3: EXAMPLE OF BOomed vs. BOomless BLADE SAIL ARRANGEMENT
(WHERE, IN EITHER CASE: A GREATER LIFT AND LIFT-TO-DRAG RATIO IS CREATED PER THE SAME SAIL AREA AS A TRADITIONAL SAIL - WHILE SHORTENING THE EFFECTIVE MAST HEIGHT AND ALLOWING SAFER AND MORE-EFFECTIVE TACKING, SAIL TRIM, AND THRUST CONTROL)

VARIABLE PITCH

(Allows helmsman to vary forward and aft thrust and close blades sufficiently to gain maximum performance)

RACK
(Foil
Pitch
Control)

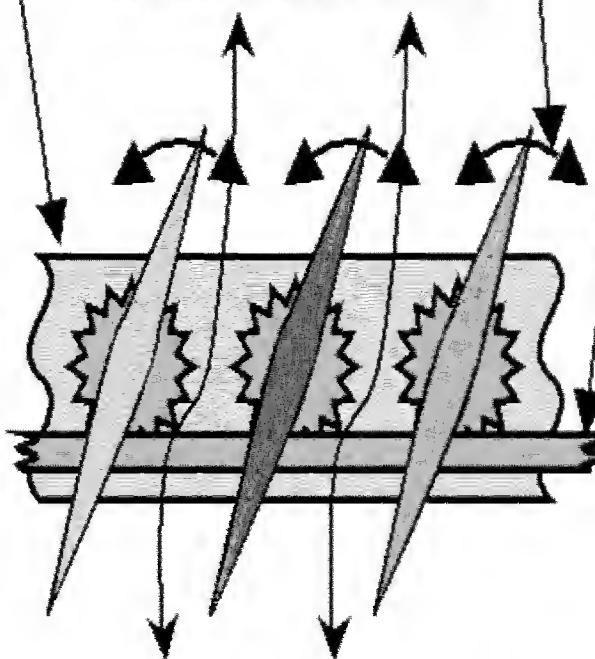
BOOM

(Optional mount for comb of airfoils; can pivot on ship to angle comb assembly)

WIND DIRECTION

LIFT

(FORWARD OR AFT
THRUST, AS HELMSMAN
FEATHERS RACK)



"OMNIDIRECTIONAL" BLADES

(BLADES CAN ACCEPT WIND FROM PORT OR STARBOARD, ROTATING TO PRODUCE LIFT – EITHER FORWARD OR AFT, AS DESIRED – WITHOUT THE NEED FOR THE BOOM FLIPPING AROUND TO HANDLE WIND FROM THE OPPOSITE DIRECTION)

FIGURE 4: CONFIGURATION OF PREFERRED BLADE SAIL MECHANISM

(BLADES CAN BE ARRANGED CLOSE TOGETHER ON A BOOM - AS SHOWN - OR DISTRIBUTED AROUND THE DECK OF THE SHIP AND PITCH-CONTROLLED BY A CONNECTION ACROSS A NEAR-DECK-LEVEL PULLEY SYSTEM - SIMILAR TO THE CURRENT HARDWARE OF TRADITIONAL LINES & WINCHES ON A SAILBOAT)

DIRECTIONAL AIRFOILS - MAY INCREASE FORWARD THRUST,
BUT MAY REQUIRE "FLIPPING" TO PROVIDE OPTIMUM THRUST
IN OPPOSITE DIRECTION (ON A TACK).

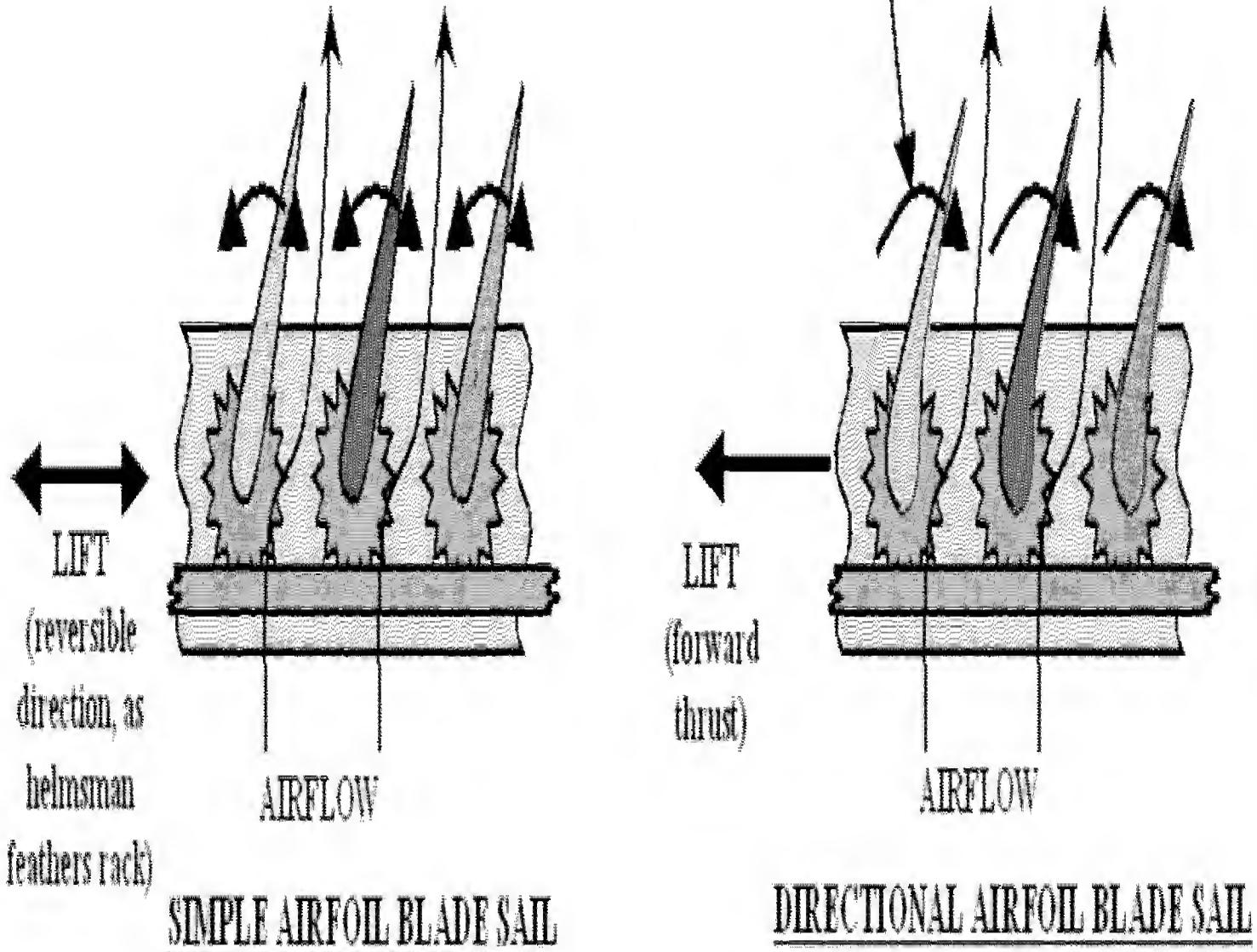
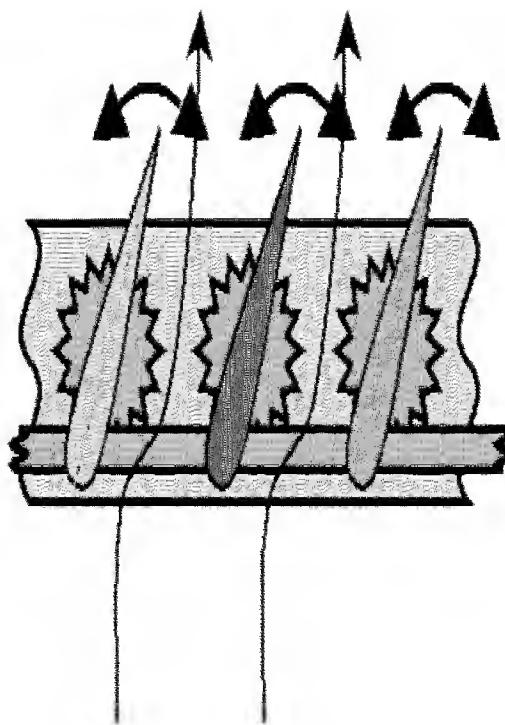
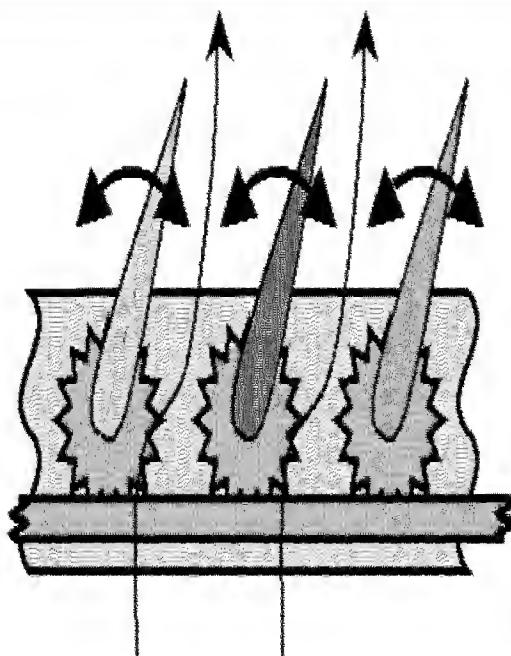


FIGURE 5: EXAMPLE OF VARIATIONS IN BLADE SHAPES (TEARDROP AND AIRFOIL, SHOWN)



"WEATHERVANING" BLADE POSITIONING
(BLADES LEEWARD OF AXLE, SO THEY
RELEASE TO ZERO LIFT WHEN RACK IS
RELEASED)

"NO-LOAD RACK" BLADE POSITIONING
(BLADES' CENTERS-OF-PRESSURE ARE
POSITIONED ON AXLE, SO THERE IS NO BIAS
TO RELEASE LIFT OF BLADES, AND NO
CONSTANT LOAD ON RACK; MORE
PERFORMANCE-ORIENTED - BUT LESS SAFE
IN MAN-OVERBOARD CONDITION)

FIGURE 6: EXAMPLES OF VARIATIONS IN BLADE POSITIONS
(WEATHERVANING AND NO-LOAD RACK, SHOWN. NOTE:
CENTROID-CENTERED BLADES MAY HAVE A TENDENCY TO DRIVE
TOWARD INCREASING THE ANGLE OF ATTACK, RATHER THAN
RELEASING LIFT, AS THE CENTER OF PRESSURE OF ALL BODIES TENDS
TO BE NEARER THE LEADING EDGE.)